

## Anaesthesiology

### UNILATERAL SUBARACHNOID ANESTHESIA WITH HYPERBARIC BUPIVACAINE 0.5% FOR SAPHENECTOMY

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**Introduction:** Spinal anesthesia with bupivacaine is characterized by a poor predictability of the spread of the local anesthetic (LA) solution in the cerebrospinal fluid and by a great individual variation in the cephalad spread of the block. The most important determinants of subarachnoid distribution of the LA solution are the baricity, the volume, the concentration of the LA and the position of the patient. The aim of this study is to evaluate the efficacy and the suitability of hyperbaric bupivacaine 0.5% for selective spinal block during saphenectomy.

**Methods:** After the patients approval, we studied 85 patients (49F,36M) aged between 34 and 67 years, scheduled to undergo saphenectomy, without contraindication for spinal anesthesia. Patients received the injection of 0.1 mgKg<sup>-1</sup> of hyperbaric bupivacaine 0.5%, the puncture was made at L<sub>2</sub>L<sub>3</sub>. During injection the patients were in lateral position, that kept for 10 minutes and then moved to the horizontal position. The performance of spinal anesthesia was standardized: after determination of the interspace, the puncture was made with a 25G needle, injecting the LA solution at a constant speed (1ml every 30 seconds). NIBP, HR, ECG, SaO<sub>2</sub> werw on line monitored during surgery. The quality of anesthesia, the maximum cephalad spread of the anesthetic block, motor block and the adverse effects (urinary retention, headache) were recorded.

**Results:** After 15 minutes sensory level was T9.3(T5-T12) and omolateral blockade was II°(Bromage scale) 26 pt, III° 59 pt; after 120 minutes 9 pt presented I° and 76 pt had complete recovery of motor block. Five pt had bilateral sensory and motor block. Hemodynamic parameters remained stable for all pt throughout the study. After 3 hours ambulation was possible in all the pt. Three pt had a urinary catheter inserted owing to retention. No PDPH was observed during the first three postoperative days.

**Conclusions:** Spinal super selective anesthesia minimizes adverse effects if performed with atraumatic needles and low dosage of hyperbaric bupivacaine 0.5%. Hemodynamic stability, rapid recovery motor block and absence of urinary retention suggest that slective spinal anesthesia is a practical technique also for day surgery.

### Anaesthetic management for invasive procedures in children with hematological malignancies

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**Introduction:** A retrospective study was carried out to analyse anaesthetic implications of different disorders observed in children with hematological malignancies submitted to invasive procedures.

**Methods:** The anaesthetic records of 62 paediatric patients with hematological malignancies, who underwent inhalatory halothane or isoflurane anaesthesia for biopsies and Broviac catheter insertion, were reviewed.

All of them had a preoperative clinical and laboratoristic evaluation including hematological tests (hemoglobin, hematocrit, RBC, WBC, platelets count, serum creatinine and hepatic enzymes), chest x-ray and E.C.G.

In every child with a preoperative hemoglobin level below 7 gr/dl or platelets count below 50.000/mm<sup>3</sup>, packed red cells or platelets were respectively infused prior to anaesthesia.

**Results:** In our patients acute leukemia (45 cases), non Hodgkin lymphoma

(11 cases) and Burkitt lymphoma (6 cases) were diagnosed.

Tumor infiltration in the oropharynx resulting in difficult intubation was observed in 5 children. Tracheostomy was performed only in a child to assure airway patency.

Mediastinal masses causing a partial airway obstruction were found in other three patients. Hyperleukocytosis (WBC greater than 100.000/mm<sup>3</sup>) was detected in 10 patients, but no one showed a leukostasis syndrome during the perioperative period.

Packed red cells or platelets were infused before or during anaesthesia respectively in 25 and 19 of 62 children

**Conclusions** General anaesthesia can be safely performed in children with acute hematological malignancies, provided that pathophysiological peculiarities of these diseases are carefully considered in planning perioperative anaesthetic management.

First of all, an accurate airway assessment is mandatory to prevent any difficult in assuring airway patency during anaesthesia induction. A beside clinical examination together with laboratory tests is also necessary to detect and treat every possible derangement.

On this subject, all efforts should be directed to prevent the serious risk of hyperleukocytosis: the leukostasis syndrome.

### REMIFENTANIL FOR LAPAROSCOPIC CHOLECYSTECTOMY

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**Introduction.** Remifentanyl (R), a new opioid agonist, has a favourable profile which determines a short predictable duration of action and a rapid offset of drug effect. Moreover there are few data in literature describing the use of R when administered as a component of a inhalation anesthetic technique. We have investigated the hemodynamic and neuroendocrine effects of 3 doses of R during laparoscopic cholecystectomy. **Material and Methods.** We studied 30 patients, physical status I and II, randomly allocated to one of 3 groups of 10 each to receive a R loading dose of 1mcg/kg and a maintenance infusion rate of 0.25mcg/kg/min (group A), 0.35mcg/kg/min (group B) and 0.50mcg/kg/min (group C). Furthermore all the patients received Sevoflurane 0.5 MAC (1.1% end tidal). Hemodynamic and neuroendocrine responses (Epinephrine and Norepinephrine) were determined at standard times: 1) post IOT; 2) during pneumoperitoneum; 3) after pneumoperitoneum; 4) at the end of the surgery. Arterial pressure and heart rate are expressed as changes respect to basal values.

**Results.** All data are summarized in table.

P<0.05 \* p<0.01 §

	Phase 1			Phase 2		
	A	B	C	A	B	C
Dhr	16±9	-2±10	-10±13*	15±24	-9±20	-5±5*
Dsap	24±11	-31±30	-41±25*	-3±9	-14±30	-31±20§
Ddap	22±9	-14±18	-40±13§	5±10	-15±7§	-30±15§
Dmap	32±10	-34±5§	-42±21§	4±16	-41±8§	-33±1§
Epin	10±2	30±28	21±13	173±153	77±95	25±15§
Norep	396±118	228±108	272±154	465±266	372±264	243±42

  

	Phase 3			Phase 4		
	A	B	C	A	B	C
Dhr	4±13	-17±18*	-15±3*	34±19	-3±11	-6±0
Dsap	15±1	-35±20*	-2±15*	-8±15	-25±2	-15±3
Ddap	31±4	-18±11*	-10±9*	19±10	-8±15*	-5±3
Dmap	9±2	-14±15*	-12±3*	4±5	-30±2*	-10±5
Epin	65±26	105±9§	31±19§	116±100	57±50	33±15*
Norep	536±301	323±107	237±215	574±313	661±335	699±107

**Conclusions.** Only the infusion of 0.5mcg/kg/min determines a complete hemodynamic and neuroendocrine control in this kind of surgery. However, as far as hemodynamic parameters, also 0.35mcg/kg/min allowed an adequate clinical anesthesia.

**Functional brain imaging with NIR system: preliminary data.**

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Near infrared spectroscopy (NIR) can be used to analyse the changes in tissue oxygenation and hemodynamics associated with neuronal activity, non invasively. We have studied the functional brain imaging with a two wavelength Amplitude Cancellation Imaging System (ACTM). Cognitive studies were performed and the functional images of the frontal area have been obtained.

**Subjects and methods**

Thirteen normal subjects (11 males, mean age  $25.9 \pm 4.8$  yrs), were included in the study. The imager probe was placed on their forehead, fixed by elastic bandage and covered by a dark cloth. After 4 minutes of baseline with the subjects resting and invited to think of nothing, the cognitive test, consisting in 4 minutes of backwards digit was performed. After the first task the subjects had 4 minutes of rest. The test was then repeated a second time to assure reproducibility. The NIR images were recorded continuously, with a period of 30 second per scan. For each subject, the Amplitude Cancellation (AC) and the Continuous Wave (CW) mode were analysed.

**Results**

In one subject (No 4, female) it was impossible to collect any signal for a poor contact between her forehead and the probe. Signal changes in accordance with the stimulation (regardless of signal region and direction) were recorded in 75% of tests (9 subjects out of 12) for the AC images and 42% for CW. Reproducibility was almost not testable for the extreme signal variability both between the first and the latter test and among the different subjects.

**Conclusion**

Non invasive brain imaging by ACTM can be obtained but with a very low specificity. Both cognitive tests activating very precise areas of the brain and simultaneously performance of gold standard functional imaging techniques (fMRI) are required to fully evaluate ACTM imager.

**References**

- 1) Edwards A.D. et Al. Lancet 1988 (8614): 770-771
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**Nosocomial Pneumonia in Severe Head Injured Patients**

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Head injured patients are at higher risk of infections, particularly nosocomial pneumonia. In our study we investigated the epidemiology of nosocomial pneumonia in head injured patients admitted to our Intensive Care Unit from January '96 to January '98, in order to identify the most frequent causative agent, the impact of the infections on the length of stay and their outcome. Forty-eight severe head injured patients (40 male, mean age  $40 \pm 21$  years, mean GCS  $5 \pm 2$  at the admission), were enrolled into the study. Diagnosis of nosocomial pneumonia was based on CDC criteria. Nineteen patients (39.5%) developed nosocomial pneumonia. None of them was intubated on the spot. All patients underwent mechanical ventilation, ranging from 7 to 32 days (mean  $19 \pm 10$  days). Mean time between admission and diagnosis was  $4.82 \pm 3.22$  days.

The patients were divided into two groups in order to allow statistical analysis, the first represented by head injured with nosocomial pneumonia, the second by head injured without nosocomial pneumonia. The incidence of nosocomial pneumonia was 39.5 % (19 patients). *Pseudomonas Aeruginosa* was the most frequent causative agent isolated. The overall mortality rate in first group was 21% (4 patients), and 41% (20 patients) in the second; the length of stay in ICU and the overall length of stay in the two groups was  $34.5 \pm 30$  days in the first versus  $11 \pm 10$  in the second group, and  $84 \pm 88$  days versus  $36 \pm 61$

respectively. Our data allow us to state that nosocomial pneumonia in head injured patients significantly prolongs the stay of patients both in ICU and in the definitive level of care. Our opinion aggressive strategy for an early and etiologic diagnosis, and an adequate empirical antimicrobial therapy in patients could contribute to improve the prognosis and prevent these complications.

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- 4) Rello J, Quintana E, et al: Incidence, etiology and outcome of nosocomial pneumonia in mechanically ventilated patients. Chest 100:439-444, 1991

**BLOOD GAS MODIFICATIONS DURING BARIATRIC SURGERY**

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The morbidly obese patients are likely to have a perioperative impairment of respiratory function. As demonstrated by several authors, the main determinant of this alteration of pulmonary gas exchange is the decreased FRC, which is further worsened by anaesthesia and surgery. The aim of this study is to evaluate the gas exchange in morbidly obese patients during bariatric surgery.

**Material and Methods.** In 84 morbidly obese patients (16 males, 68 females; TBW.144 $\pm$ 25, BMI >40) undergoing elective bilio-pancreatic diversion, blood gas analysis were performed at: Phase 1: anaesthesia-induction; Phase 2: after laparotomic incision; Phase 3: after positioning of retractors; Phase 4: in reverse Trendelenburg position. Anaesthesia regimen was standard for all the patients. Ventilatory setting consisted of: Tidal volume 7-8 ml/kg, RR 10-12 bpm aimed at  $ETCO_2 < 32$  and PAW peak <35 mmHg.

Data are presented as means  $\pm$  S.D., related to patients sex.

Statistical analysis over results was performed by ANOVA and regression analysis.

**Results.** Inter-groups  $P < 0.05$  #-#  $p < 0.01$  @-@ intra-group  $p < 0.05$  \*  $p < 0.01$  \*\*

Patients sex		Phases			
		1	2	3	4
DAaO <sub>2</sub>	F	170 $\pm$ 13	190 $\pm$ 12*	194 $\pm$ 12#	171 $\pm$ 12#
	M	209 $\pm$ 23	191 $\pm$ 20*	274 $\pm$ 21#	267 $\pm$ 20#
PaO <sub>2</sub>	F	202 $\pm$ 12#	153 $\pm$ 7	160 $\pm$ 9	190 $\pm$ 9#
	M	164 $\pm$ 16#	153 $\pm$ 12	123 $\pm$ 10	156 $\pm$ 11#
Paw <sub>peak</sub>	F	33 $\pm$ 1	33 $\pm$ 2	33 $\pm$ 1	29 $\pm$ 1
	M	28 $\pm$ 2	31 $\pm$ 2	30 $\pm$ 1	26 $\pm$ 1
Paw <sub>mean</sub>	F	9.8 $\pm$ 0.8	9.5 $\pm$ 1.1	9.4 $\pm$ 1.0	8.5 $\pm$ 0.8
	M	7.7 $\pm$ 0.9	8.1 $\pm$ 1.1	11.1 $\pm$ 1.6	6.9 $\pm$ 0.8
Paw <sub>plateau</sub>	F	24 $\pm$ 1.0	24 $\pm$ 1.1	24 $\pm$ 1.0	21 $\pm$ 1.2
	M	22 $\pm$ 1.1	22 $\pm$ 1.2	23 $\pm$ 1.2	20 $\pm$ 1.3
Compliance	F	34 $\pm$ 2.0	33 $\pm$ 1.7	32 $\pm$ 2.0	38 $\pm$ 1.2*
	M	39 $\pm$ 1.5	38 $\pm$ 1.0	38 $\pm$ 1.0	45 $\pm$ 1.3**

**Conclusions.** Using our ventilatory setting all patients were adequately oxygenated. However, we observed an increase of DAaO<sub>2</sub> in phase 2 and 3 with statistical significant differences between males and females observed during phase 3 (after retractors positioning) and in phase 4. These differences indicate that the patients with android obesity are more susceptible to develop alterations of gas exchange, and that even reverse trendelenburg position is unable to revert this impairment.

# **COMPLICATIONS OF ICP MONITORING**

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Intracranial pressure (ICP) monitoring is routinely used in the management of severe head injuries. Usually, a ventricular catheter (connected to an external transducer) is the most accurate and reliable method for ICP monitoring and enables therapeutic CSF drainage. Infections and hemorrhages, even if rare, are the most frequent complications associated with ICP monitoring. We studied 228 patients with severe head injuries admitted to our General Intensive Care from January 1994 to October 1998. ICP monitoring with ventricular/subarachnoid catheters were used in 180 patients (78.9%). Meningitis, defined as an abnormal cerebrospinal fluid formula suggestive of bacterial infection with Gram stain and in presence of a positive culture obtained from the monitor tip, was the most frequent complication (6 pts, 3%). Catheter tip cultures were positive for *Staphylococcus Epidermidis* (2 cases), *Acinetobacter Anitratus* (2 cases), *Staphylococcus Aureus* (1 case) and *Pseudomonas aeruginosa* (1 case). No complications occurred during insertion of the ICP monitors. Osteomyelitis and wound infection were not detected. All patients with meningitis had a concomitant subarachnoidal hemorrhage, 4 had increased system manipulation, 3 had cerebrospinal fluid leakage. Antibiotic prophylaxis decreased the rate of superficial infections but was not beneficial in patients with skull fractures complicated by CSF leaks. The duration of ICP monitoring did not adversely affect the infection rate. The use of Bacitracin flush solutions for maintenance of the lumen patency did not significantly influence the development of infection. Our study seem to show a reduction in infections with decrease system manipulation and CSF drainage, with the tunneling of the ventricular catheter through the scalp between the dermis and galea, by caring the catheter with appropriate procedures (the external part of catheter was ensheathed in a sterile plastic sheath and its connections were kept wrapped in sterile iodine soaked gauze which was changed every 8 hours and all patients received two or three doses of antibiotic prophylaxis with 2.3 g of Cloxacillina at the time of catheter insertion).

## **Postoperative analgesia for major surgery with continuous epidural infusion of sufentanil.**

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**Introduction.** Several techniques for postoperative pain relief are currently used. The objective of this study is to analyse the real efficacy of continuous epidural infusion of sufentanil (1) for postoperative analgesia in patients undergoing major thoracic or abdominal surgery. **Methods.** 27 patients (mean age  $58 \pm 18$  yrs) undergoing thoracic, vascular and abdominal surgery were enrolled in the study. In all patients an epidural catheter through a 17 gauge Tuohy needle was placed: at T4-T10 for thoracic surgery at T10-L1 for high abdominal or vascular surgery and tested with 2 mL lidocaine 2%. Before induction of general anesthesia an epidural sufentanil bolus (1mcg/kg in normal saline 15 mL) was administered and a sufentanil continuous infusion of 2 mcg/mL for 48 postoperative hours (500 mcg in normal saline 250 mL at 5 mL/h) started, through an elastomeric device connected to the epidural catheter. General anesthesia was induced with STP 3-5 mg/kg, alfentanil 40 mcg/kg and maintained with isoflurane 0.5-1% in  $O_2:N_2O$  (50:50) and when necessary, alfentanil 10 mcg/kg. Numeric Ordinal Verbal Scale (by Keele modified) was used for control pain degree: 0=no pain; 1=smooth pain; 2=moderate pain; 3=strong pain; 4=severe pain. The level of sedation was assessed using Ramsey scale (1=alert; 2=drowsy; 3=very drowsy and

disoriented; 4=stuporous). Pain intensity, heart rate, respiratory rate, arterial pressure, sedation, additional analgesic drugs, side effects of drugs were assessed at: T0 (end surgery, patients awake), 6, 12, 24, 48, 72 postoperatively hours. **Results.** No complication related to epidural catheter placement was observed. Two pts showed respiratory depression at T0, reversed by naloxone 0.04 mg IV. Among the 27 pts, 12 of them did not suffer from pain in the entire time of evaluation; 10 pts had a pain intensity of 1 in the first 24 h and became 0 in the following hours. In the last 5 pts a pain level of 2 was recorded in the first 12 hours, of 1 in the next 24 hours and 0 at T48 and T72. Supplementary analgesia (ketorolac), was necessary for 9 patients. Sedation level was 3 in the first 6 hours, and 1 in the following hours. The pts did not show any surgical complication but 6 pts showed side effects (PONV) related to epidural drug infusion. **Discussion.** This study, conducted specifically in major abdominal, vascular and thoracic surgery, suggests that epidural sufentanil administered as a bolus followed by continuous infusion is safe and effective for postoperative pain relief. During the first postoperative hours, sedation is a well-known side effect of epidural sufentanil, but not always undesired. Furthermore, no patient was unrousable; sedation did not appear to delay either weaning from mechanical ventilation at the end of surgery and anesthesia emergence or complicate either nurse procedure or pulmonary physiotherapy. **In conclusion:** Sufentanil epidural infusion is effective and safe for postoperative pain relief in pts undergoing major surgery. **References:** (1) Vigdis Hansdóttir et al. The analgesic efficacy and adverse effects of continuous epidural sufentanil and bupivacaine infusion after thoracotomy. *Anesth Analg* 1996; 83:394-400.

## **Anesthetic technique for inguinal herniorrhaphy**

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**Introduction.** Improvement of anesthesiologic and surgical techniques for inguinal hernioplasty significantly reduced duration of the procedure and postoperative length of staging (LOS). **Methods:** From 1995 to 1998, 239 male patients (mean age  $55 \pm 15$ ) underwent inguinal hernioplasty. Four anesthetic techniques were used: surgical field infiltration with local anesthetics (LA) (113 pts) (carbonated lidocaine 1% + bupivacaine 0.25%); epidural anesthesia (90 pts) with lidocaine 2% + fentanyl 100 mcg; general anesthesia (25 pts) with  $O_2 + N_2O$  + isoflurane + fentanyl; intrathecal anesthesia (11 pts) with hyperbaric bupivacaine 1% (30 mg). Statistical analysis was performed with Student's T test and  $p < 0.05$  was considered significant. **Results** are reported in the following table:

Anesthesia	N	Duration (min)	Foley	Sedation	Intraop hypot	Intraop hypert	Postop analgesia	Postop LOS
LA	113	$72 \pm 16$	0	31*	0	2	23	$1.5 \pm 1.7$
Peridural	90	$81 \pm 30$	2	8	2	1	25	$2.4 \pm 2.2$
General	25	$87 \pm 19$	0	0	0	0	6	$2.3 \pm 1.7$
Intrathecal	11	$82 \pm 20$	1	0	1	0	1	$4.5 \pm 4*$

\* $p < 0.05$

**Discussion.** No difference in intraoperative complications were observed between epidural and local anesthesia. Postoperative length of staging for local anesthetics was shorter than epidural anesthesia. Postoperative length of staging for intrathecal anesthesia was longer than the other groups. **In Conclusion** the improvement of anesthetic (local and peridural) and surgical techniques reduces postoperative length of staging without of intraoperative or postoperative complications.



**Hemodynamics and oxygenation during dobutamine infusion in lung transplant candidates.**

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**Introduction** The aim of this study is to analyze the effects of dobutamine (DB) on pulmonary and systemic hemodynamics and oxygenation in lung transplant candidates. **Methods** 45 patients (21 M e 24 F; mean age  $42 \pm 18$  years; mean BSA  $1.62 \pm 0.28 \text{ m}^2$ ) in waiting list for lung transplantation were studied: (pulmonary fibrosis 14, COPD 15, cystic fibrosis 16). They were studied awake, while spontaneously breathing in two different phases: baseline –  $\text{O}_2$  100%; DB phase –  $\text{O}_2$  100% after 10 minutes of continuous infusion DB ( $10 \text{ mcg/Kg/min}$ ). Blood gas samples and hemodynamic data were collected during right heart catheterization. Data were statistically analyzed by Student's T-test and  $p < 0.05$  was considered significant. **Results** In no patient any complication occurred during the test. The effect of DB on pulmonary circulation has not been extensively assessed in patients with mild-to-moderate pulmonary hypertension. DB caused a significant increase of cardiac output ( $3.23 \pm 1.45$  vs.  $4.77 \pm 1.81 \text{ L min}^{-1} \text{ m}^{-2}$   $p < 0.001$ ) with a reduction in systemic vascular resistance ( $2373 \pm 834$  vs.  $1583 \pm 497 \text{ dynes sec cm}^{-5} \text{ m}^{-2}$   $p < 0.0001$ ) and in pulmonary vascular resistance ( $451 \pm 237$  vs.  $365 \pm 241 \text{ dynes sec cm}^{-5} \text{ m}^{-2}$ ). A significant increase of pulmonary shunt ( $22 \pm 8$  vs.  $28 \pm 8 \%$   $p < 0.01$ ) was also observed. **Discussion** The fall in pulmonary vascular resistance was not proportional to the increase of cardiac output, mean pulmonary artery pressure and transpulmonary gradient increased, confirming the inotropic activity of DB (1). The prevalent role of vascular recruitment as mechanism in PVRI reduction during DB is supported by the concomitant fall in  $\text{PaO}_2/\text{FiO}_2$ . This strongly suggests a worsening of regional  $\text{Va/Qc}$  due to an increased perfusion of poorly ventilated areas. **Conclusions** Dobutamine has a favorable hemodynamic effect in mild-to-moderate pulmonary hypertension in lung transplant candidates. DB reduces PVRI through a recruitment of vessels due to an increase of pulmonary flow. In clinical application DB has to be titrated carefully to avoid excessive increase of mPA and decrease of oxygenation, in that case, the association with inhaled nitric oxide should be useful to counterbalance these unfavorable effects.

**Reference** (1) Ruffolo R. R. Jr. The pharmacology of dobutamine. Am J Med Sci 1987;294(4):244-248

#### ANAESTHESIA WITH PROPOFOL FOR TRANS-STERAL THYMECTOMY IN MYASTHENIC PATIENTS

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**Introduction.** The aim of this study is to use a non-muscle relaxant anaesthetic technique with propofol fentanyl in  $\text{N}_2\text{O}:\text{O}_2$  for patients with myasthenia gravis undergoing thymectomy. **Methods.** 41 myasthenic patients (28 female, 13 male) scheduled for trans-sternal thymectomy (25 thymoma, 16 thymic hyperplasia) were studied. Mean age was  $40 \pm 14$  years, with a mean body weight of  $63 \pm 14 \text{ Kg}$ . Mean preoperative  $\text{Fev}_1$  was  $2.1 \text{ L/sec}$ , 70% of predicted values (range 1.5-3.2 L/sec, 58-90%). All patients received anticholinesterase therapy with pyridostigmine, in 9 of them associated with prednisone; 11 patients were preoperatively treated with plasmapheresis. The severity of disease was graded with Osserman classification (35 pts class II a, b and 6 class III). Patients did not receive any premedication. Patients were monitored with EKG, pulse oxymetry, systemic invasive arterial pressure and  $\text{EtCO}_2$ . Neuromuscular transmission was monitored with TOF-Guard (Organon). Before induction of anaesthesia, lidocaine 2% and 10% spray was used for topical anaesthesia of pharynx and larynx.

After few minutes of preoxygenation by face mask, anaesthesia was induced with propofol  $1.5 \pm 0.5 \text{ mg/Kg}$  fentanyl  $\text{mcg/Kg}$  and droperidol  $0.1-0.3 \text{ mg/Kg}$ . During laryngoscopy topical anaesthesia for vocal cord and trachea was performed with lidocaine 2% through a laryngeal syringe (LTA kit, Abbott). After two minutes the trachea was intubated. Anaesthesia was maintained with  $\text{N}_2\text{O} : \text{O}_2$  (67: 33) associated to propofol continuous infusion and supplemented by fentanyl boluses ( $0.7-1 \text{ mcg/Kg}$ ). A ketoralac (180 mg) and morphine (20mg) i.v. continuous infusion was used for two days postoperative pain relief. At the end of surgery when the patients were awake, with a respiratory rate  $> 10/\text{min}$  and tidal volume  $> 450 \text{ mL}$ , they were extubated and transferred to ICU. **Results.** Intubating conditions were excellent in all patients. Mean anaesthesia time was 148 min (range 85-240), fentanyl redoses were 53. Neuromuscular transmission showed no significant modification. As far as it regards cardiovascular modification: heart rate did not change while mean systemic arterial pressure decreased during propofol continuous infusion (25% of baseline values). All patients were extubated in operative room. Two patients were reoperated on for bleeding and after surgery were mechanical ventilated respectively for 12h and 24h. In **conclusion**, our technique with propofol and fentanyl in  $\text{N}_2\text{O} : \text{O}_2$  for anaesthesia in myasthenic patients avoids muscle relaxant, offers excellent intubating conditions, with minimal modification in neuromuscular junction, and without postoperative respiratory depression

#### COMBINED SPINAL-EPIDURAL TECHNIQUE FOR ENDOVASCULAR REPAIR OF INFRA-RENAL ABDOMINAL AORTIC ANEURYSMS

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**Introduction:** The single interspace needle-trough-needle combined spinal-epidural (CSE) technique was first described in orthopedics and more extensively used in obstetrics. It offers the advantages of both techniques, minimizing the disadvantages, though possible concerns and precautions have been advocated. Purpose of study has been to evaluate effectiveness and safety CSE anaesthesia for endovascular repair of abdominal aortic aneurysms (AAA).

**Methods:** After obtained informed consensus, 40 pt ASA III (mean age  $67 \pm 11$  years) who were undergoing endovascular repair AAA, were included in the study. All pt received atropine  $0.01 \text{ mg/Kg}^{-1}$  and diazepam  $0.1 \text{ mg/Kg}^{-1}$  p.o. premedication before surgery. CSE anaesthesia was performed to all the pt using double needle in single interspace ( $\text{L}_1\text{L}_2$  or  $\text{L}_2\text{L}_3$ ) technique. Intrathecally were injected 12-15 mg of hyperbaric bupivacaine 0.5%, then an epidural catheter was positioned and in epidural space were administered 7 ml of ropivacaine 0.75% when anaesthesia level become inadequate. Continuous intraoperative checking included ECG, IBP (radial artery), HR,  $\text{SaO}_2$ . Onset of analgesia, onset of motor block, maximum cephalad spread (pinprick test), quality of anaesthesia (four point scale), extradural local anesthetic request were evaluated. Data ( $\text{m} \pm \text{SD}$ ) were examined statistically.

**Results:** Total anaesthetic and surgery time was  $158 \pm 17$  minutes. Intraoperative analgesia was considered good or excellent by most of patients (89%). No significant changes in hemodynamic parameters occurred. Ten patients required supplementary extradural local anesthetic.

**Conclusion:** the application of CSE anaesthesia is feasible for endovascular treatment of AAA. The arterial blood pressure remained stable throughout the procedure, and 81% patients were mobilized on the first day. Based on these results, it appears that CSE anaesthesia is feasible, effective and safe for endovascular AAA repair.

# **Hemodynamic monitoring with PiCCO during major abdominal and thoracic surgery.**

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**Introduction:** The aim of the study is the evaluation of volumetric parameters obtained with Pulsion PiCCO monitor (Medical System, Munich, Germany) in patients undergoing major abdominal and thoracic elective surgery.

**Materials and method:** Fifteen patients (12 males and 3 females, mean age  $62 \pm 39$  yrs) were enrolled in the study: 8 underwent major general surgery and 7 pulmonary resection. All patients were premedicated with diazepam 3 mg per os and monitored with ECG and SpO<sub>2</sub>. General anesthesia was induced with propofol (2 mg/Kg), vecuronium (0.08 mg/Kg) and fentanyl (3 mcg/Kg) and mechanical ventilation delivered via a tracheal or a left-sided endobronchial double-lumen tube. After induction of anesthesia an arterial catheter was placed in the femoral or brachial artery and then connected with PiCCO monitor in order to obtain AP, continuous cardiac index and volumetric parameters (ITBVI and EVLWI). Anesthesia was maintained with isoflurane (0.5-1 %), vecuronium and fentanyl and dopamine 2 mcg/Kg/min was infused to support diuresis. Hemodynamic and volumetric parameters were evaluated at the beginning (T1), during surgery (T2) and at the end (T3) of the procedure. Statistical significance for  $p < 0.05$  was evaluated by Student's t test between phase T1 and T2, T2 and T3, T1 and T3.

**Results:** mAP increased from T1 to T3 (T1:  $73.6 \pm 11.7$  mmHg; T3:  $91 \pm 22$  mmHg;  $p < 0.05$ ). CVP, CI and CFI and ITBI showed a similar trend over time, even if not statistically significant. Extravascular lung water (EVLWI) increased at T2 (T1:  $9.23 \pm 4.8$  ml/m<sup>2</sup>; T2:  $10.7 \pm 5.4$  ml/m<sup>2</sup>  $p < 0.05$ ) and returned below baseline values at T3 (T3:  $8.3 \pm 4.1$  ml/m<sup>2</sup>;  $p < 0.05$ ).

**Discussion:** Hemodynamic and volumetric monitoring by PiCCO represent a useful guide for intraoperative fluid replacement: EVLWI values quantify pulmonary edema while ITBI is useful to assess cardiac preload. Adequate fluid therapy and choice among crystalloids, colloids and hemocomponents (albumin, fresh frozen plasma, blood units) allow to improve hemodynamics and to control extravascular lung water.

**Conclusions:** Volumetric monitoring by PiCCO is useful in addition to standard monitoring to assess patient's hemodynamic condition during major surgical procedures and it is helpful to estimate blood loss, to guide fluid therapy and to evaluate the requirement of more specific cardiovascular or respiratory support and the occurrence of pulmonary edema.

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# **SEDATION FOR CHILDREN UNDERGOING RECURRENT MINOR INVASIVE PROCEDURES**

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**Introduction** Children with malignancies require frequent painful invasive procedures such as lumbar puncture, biopsies and bone marrow aspirations. Anxious parents rightly expect their infant and children to receive safe, effective sedation and analgesia during these diagnostic or therapeutic procedures.

The aim of this study was to evaluate the efficacy and safety of a sedation protocol used in children undergoing minor invasive painful procedures.

**Methods** Forty infants and children with solid tumours (20 cases) or hematological malignancies (20 cases), aged 4 month to 10 years (mean  $5 \pm 3$  years) were recruited.

At the time of premedication with flunitrazepam (0.05 - 0.1 mg Kg<sup>-1</sup> p.o) an anaesthetic ointment (EMLA) was applied on the site of peripheral vein puncture of patients unprovided with central venous catheter (CVC).

The same anaesthetic cream was put close to skin sites concerning invasive procedures to obtain analgesia.

Anaesthesia induction was achieved by Propofol (2 mg Kg<sup>-1</sup>) in patients with CVC. Patients without CVC were made unconscious with administration of N<sub>2</sub>O (60%) and O<sub>2</sub> by face mask, before a peripheral venous line was assured.

In all patients sedation was maintained by boluses of Propofol (maximum dosage = 5 mg Kg<sup>-1</sup> h<sup>-1</sup>).

During procedures HR, RR, NIBP SpO<sub>2</sub> and sedation level were monitored in every patient. Recovery time and perioperative complications were also registered.

**Results** The level of sedation was considered excellent by operators in 87 per cent of children. Moderate movements were observed during skin punctures only in 15 of 114 procedures. No significative perioperative modifications of vital parameters were registered.

Pain, tactile or vocal stimuli responses were obtained respectively in  $2 \pm 1$ ,  $3 \pm 1$  and  $5 \pm 2$  min. after drug injection. The mean time to obtain complete awakening (spontaneous eyes opening) was  $6 \pm 2$  min, and the criteria for home discharge were reached within  $59 \pm 2$  min.

During and after procedure no complications were observed.

**Conclusions** Our results show that Propofol associated with inhalatory nitrous-oxide and local topic anaesthetics is an effective and safe sedative agent for pediatric patients undergoing minor invasive procedures.

## Cardiovascular Surgery

### SIMULTANEOUS CORONARY AND ABDOMINAL AORTIC SURGERY ON THE BEATING HEART: EARLY OUTCOME

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**Background:** Simultaneous coronary artery bypass grafting (CABG) and abdominal aortic surgery (AAS) with conventional technique has been reported with improved results when compared with staged operation. However, concerns are still related to the non physiological nature of cardiopulmonary (CPB). The purpose of this study is to evaluate preliminary outcomes in a cohort of 20 patients undergoing simultaneous CABG and AAS without CPB.

**Methods:** Between January 1996 and September 1998, 20 patients (mean age  $64.55 \pm 7.96$  years) underwent combined CABG and AAS without the employing of CPB (off pump). Abdominal aortic disease consisted of either abdominal aortic aneurysm greater than 6 cm in diameter (AAA) or end-stage aortic occlusive disease (AOD), as diagnosed by routine abdominal angiography during coronary evaluation. Exclusion criteria included impaired left ventricular function (ejection fraction of  $<25\%$ ), recent myocardial infarction ( $<1$  month), coronary artery disease involving the distal circumflex artery, reoperation, combined valve surgery, respiratory and renal impairment, previous stroke and coagulopathy. There were  $1.95 \pm 0.69$  grafts per patient with a total of 39 distal coronary anastomoses. Abdominal aortic surgery consisted of 16 straight and 4 bifurcated grafts inserted.

Haemodynamic measurements as well as inotropic requirement, incidence of arrhythmias, and perioperative myocardial infarction (POMI), were recorded. Furthermore, subsystem clinical outcomes, ITU and hospital length of stay, blood loss and transfusion requirement were also carried out.

**Results:** There were neither deaths nor perioperative myocardial infarction (POMI), stroke, or acute renal failure. Three patients (15%) showed incidence of supraventricular tachyarrhythmias (SVT), whereas 6 patients (30%) required minimum to moderate inotropic requirement. One patient (5%) suffered of chest infection which determined a longer intubation time. Blood loss was  $673 \pm 246.8$  mls with low transfusion requirement. The ITU and hospital length of stay were  $2.12 \pm 0.33$  and  $7.08 \pm 1.44$  days respectively. Clinical follow-up at a mean of 10 months showed all patients in NYHA class I with no cardiac or abdominal events occurred.

**Conclusions:** A simultaneous operation on beating heart for CABG and AAA repair is safe and effective. Perioperative clinical morbidity is low. Short ITU and hospital length of stay associated with low blood loss and transfusion requirement may clearly account for less costs.

### Myocardial revascularization with and without cardiopulmonary bypass

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**Objective.** Coronary artery bypass grafting on a beating heart without cardiopulmonary bypass (CPB) is a surgical approach evolving in these years. To evaluate the effectiveness of this procedure we analyze our surgical activity comparing two groups of patients who underwent the same procedure with or without cardiopulmonary bypass. **Material and methods.** From May 21, 1997 to December 31, 1998, 472 patients underwent myocardial revascularization without (group A), and 290 patients underwent the same procedure with CPB (group B). Group A patients were older than those in group B, whereas redo and left main disease incidence were higher in group

B. **Results.** Crude mortality was 1.9% in group A vs 3.8% in group B ( $p=ns$ ); however, risk adjusted mortality was 1.8% vs 2.8%. Incidence of cerebrovascular accident (CVA) was 0.4% vs 1.7% ( $p=ns$ ). Postoperative complications (deaths and CVA included) was 3.8% vs 10.0% ( $p=0.002$ ). Intensive care unit stay was  $12.6 \pm 7.9$  vs  $20.6 \pm 22.8$  hours ( $p=0.001$ ) and in hospital postoperative stay was  $4.0 \pm 1.8$  vs  $4.7 \pm 1.8$  days ( $p=0.001$ ). At mean follow up of  $8.4 \pm 5.6$  months, survival was higher in group A  $98.1 \pm 0.6$  vs  $95.1 \pm 1.3$ ,  $p<0.05$ , whereas event free survival was similar ( $96.7 \pm 0.8$  vs  $94.4 \pm 1.4$ ,  $p=ns$ ). **Conclusion.** Myocardial revascularization without cardiopulmonary bypass is a technique that, in selected patients, provide faster recovery and reduction of mortality and morbidity.

### A NEW SURGICAL TOOL FOR THE CORRECTION OF MYXOMATOUS MITRAL REGURGITATION WITH BILEAFLET PROLAPSE: THE DOUBLE ORIFICE REPAIR

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**Background:** Myxomatous disease with prolapse of both mitral leaflets (Barlow disease) is a surgical challenge. Repair of mitral regurgitation (MR) due to elongated subvalvar apparatus, redundant leaflets and dilated mitral annulus requires long and complex procedures including papillary muscles shortening, leaflet resections, multiple chordal replacement. Results with this procedures are not predictable and scarcely reproducible. Moreover, the anatomical features of the disease increase the risk for post-repair systolic anterior motion of the anterior leaflet (SAM) in most cases. The double orifice repair is an alternative method of mitral reconstruction which is particularly suitable for the correction of MR in Barlow disease.

**Methods:** From October 1993 through December 1998, 62 consecutive patients (38M, 24F, mean age 51 yrs) with severe MR due to Barlow disease were admitted at our institutions. MR was due to elongation of chordae and prolapse of both leaflets in 42 pts, the rupture of one or more chordae was also associated. Most patients (49) were in NYHA class I and II while only 13 patients were class III or IV. Preoperative planimetric valve area was  $6.9 \pm 1.46$  cm<sup>2</sup> by echocardiography. All patients were submitted to mitral repair by means of the double orifice repair. The technique requires the creation of two orifices by the suture of the free edge of the anterior and posterior leaflets in their middle portion: the method is effectively corrects MR by promoting central coaptation and abolishing leaflets. An annuloplasty with a prosthetic ring was associated in 41 patients to increase the coaptation area.

**Results:** There were no operative or hospital deaths. Postoperative TEE showed no or trivial residual MR in 39 pts, mild regurgitation in 21 pts and moderate in 2 pts. No patient had postoperative severe MR. No patient experienced postoperative SAM. Planimetric postoperative valve area was  $3.3 \pm 0.59$  cm<sup>2</sup>, no significant gradient across the valve was ever detected. Follow-up was 100% complete (mean follow-up 1.7 yrs, 92 pt-yrs). There were no late deaths. During the follow-up period required reoperation for recurrent MR due to acute endocarditis; he underwent uneventful mitral valve replacement (freedom from reoperation  $89 \pm 11\%$  at 4 years). At latest follow-up no patient suffers of mitral stenosis, mean valve area is not different from the perioperative determination. All patients but one are in NYHA class I or II.

**Conclusions:** The double orifice repair technique is a simple and reproducible surgical method to effectively correct MR due to Barlow disease. Long term follow-up is needed to exclude the theoretical risk of reconstruction laceration and of leaflet fibrosis. At latest follow-up, the stability of the repair is demonstrated by stable valve function and by the clinical status of the patients. The technical simplicity of the repair opens the perspective of percutaneous repair of mitral regurgitation.



# **SURGICAL TREATMENT OF PRIMARY CARDIAC TUMOURS IN CHILDREN: A 13 YEAR EXPERIENCE.**

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**OBJECTIVE:** Assessment of the efficacy of surgery in the treatment of the hemodynamic disturbances related to primary cardiac tumors (CT).

**METHODS:** Between 1983 and 1995, 14 pts (10 male, 4 female) aged 1 day to 14 yrs underwent surgical excision of primary CT. Eight pts (57%) were neonates. All had symptoms of progressive heart failure (78,5%), 2 tachyarrhythmia and 1 pericardial tamponade. Diagnostic assessment included 2D-Echo (71,4%), angiography (7,2%), combination of both (21,4%). The CT was isolated in 9 (64,3%) and multiple in 5 (35,7%), it was primarily in the left ventricle in 7 (50%), in the right ventricle in 4 (28,5%), in atrial chambers in 2 (14,2%). In 1 patient the tumor involved the origin of the great vessels and the upper mediastinum. The surgical treatment included different approaches depending of tumour location. A Ross operation was carried out in 1 pt with rhabdomyosarcoma of the left ventricular outflow tract involving the aortic valve. Replacement of both ascending aorta and pulmonary artery with valved conduits was necessary in 1 pt with malignant tumor of the base of the heart involving the coronary ostia. Two pts with unresectable CT underwent heart transplantation. Histology showed rhabdomyoma in 9 cases, rhabdomyosarcoma in 2, Ewing's sarcoma in 1, fibroma in 1 and mixoma in 1 case.

**RESULTS:** There were no intraoperative deaths. Two pts died of low cardiac output syndrome and transplanted graft failure respectively. One pt developed embolic neurologic damage. Over a mean follow-up interval of 118 months (range 39-179) 1 pt died 2 years from the operation due to metastatic neoplasm (Ewing's sarcoma). Local recurrence of cardiac tumour after 12 months occurred in 1 patient (left atrial rhabdomyoma). Four pts (50%) with rhabdomyoma showed tuberosus sclerosis. All survivors were in NYHA I class at the last follow-up.

**CONCLUSIONS:** Primary CT are rare in infancy and their clinical presentation is mostly related to hemodynamic disturbances. Surgical treatment of CT can be accomplished with acceptable mortality and is virtually curative for benign ones. Early and aggressive surgical resection of malignant CT may represent the only effective treatment. Complete resection is required for improved survival. Finally, orthotopic cardiac transplantation may represent the treatment of choice for patients with unresectable but locally aggressive tumors involving exclusively the heart.

# **CRYOPRESERVED HOMOGRAFTS FOR RIGHT VENTRICULAR OUTFLOW TRACT RECONSTRUCTION.**

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**OBJECTIVE:** Revision of our experience with cryopreserved homografts (HG) used for right ventricular outflow tract (RVOT) reconstruction in order to assess their intermediate and long-term performance.

**METHODS:** Between July 1982 and December 1998, 160 patients received a cryopreserved pulmonary (n=98: 61.2%) or aortic (n=62: 38.8%) HG for RVOT reconstruction as part of repair of congenital cardiac lesions with right ventricular-pulmonary artery discontinuity. Indication for operation was pulmonary atresia with ventricular septal defect in 60 cases (37.5%), tetralogy of Fallot in 48 (30 %), transposition complexes in 21 (13.2%), truncus arteriosus in 11 (6.9%), double outlet right ventricle in 9 (5.6%), pulmonary atresia with intact ventricular septum in 6 (3.7%). Moreover, in 5 patients (3.1%) the HG was used for RVOT reconstitution as part of a Ross operation. One hundred-thirteen patients (70%) had already undergone a previous operations: 30 (18.7%) palliative and 83 (51.8%) corrective (19 without valved conduit). Ninety-six patients (60%) had placement of the HG as a

primary conduit repair, whereas 64 patients (40%) underwent replacement of previous conduits (HG=27: 42%; non-HG=37: 58%).

**RESULTS:** Overall hospital mortality was 6.9% (11/160). It was higher for patients in whom HG were implanted during the initial cardiac repair (n=8: 8.3%) than in cases of reoperation for conduit replacement (n=3: 4.7%). There were 6 late death (late mortality=4%), 3 of whom at reoperation. During a follow-up interval ranging between 1 month and 16.5 years reoperations for HG failure were carried out in 27/149 patients (18.1%).

**DISCUSSION:** Accelerated degeneration of HG in paediatric patients has been reported. Several factors are involved, such as type of HG (aortic or pulmonary), methods of preservation, age of implantation, operative technique, cellular viability and immunologic response.

**CONCLUSIONS:** Cryopreserved HG can be used for reconstruction of RVOT as part of repair of congenital heart lesions with an acceptable mortality and low morbidity. Their deterioration is a crucial issue which deserves accurate both clinical and experimental investigation.

# **IS ANNULOPLASTY NECESSARY FOR MITRAL REGURGITATION CAUSED BY ISOLATED ANTERIOR LEAFLET PROLAPSE ?**

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**Introduction :** The use of annuloplasty in case of mitral valve repair (MVR) for isolated prolapse of the anterior leaflet is still controversial<sup>1,2</sup>. We retrospectively analyzed patients operated on for mitral insufficiency using three different annuloplasty approaches, namely rigid prosthetic ring (group A), biological ring (group B), and no ring (group C).

**Methods :** Fifty-nine patients (22 in group A, 20 in group B, and 17 in group C) underwent MVR for isolated prolapse of the anterior leaflet. There were no differences among groups concerning mean age (54, 52, and 48, respectively), gender, preoperative NYHA Class, and mechanisms of mitral regurgitation. Prolapse of the anterior leaflet was treated with different techniques. Annuloplasty was performed with Carpentier ring in group A, with posterior autologous pericardial ring in group B, and no ring was applied in group C where no annuloplasty or limited Kay annuloplasty was performed. No anatomical factor dictated the decision upon applying or not a ring.

**Results :** Mean follow-up was 3.4 years (from 1 year to 11 years). No differences were found concerning postoperative deaths or need for reintervention at long term. Late reoperations (2 cases) in group C were not related to the absence of the annular ring (endocarditis and chordal rupture, respectively). Echocardiographic assessment did not reveal any difference among groups on the degree of residual mitral regurgitation during follow-up.

**Discussion :** Application of prosthetic or biological ring to perform annuloplasty is a common procedure in MVR. Nonetheless, no objective evidences have been shown regarding the real need in case of mitral insufficiency secondary to isolated prolapse of the anterior leaflet, which may cause limited annular dilatation.

**Conclusions :** Our data indicate that, as suggested by some investigators in the literature, the application of a ring during MVR caused by isolated prolapse of the anterior leaflet does not apparently influence postoperative results. Randomized prospective study in this particular pathologic setting is therefore advisable to solve this dilemma.

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### LEFT VENTRICULAR ASSIST DEVICE (VAD) AS BRIDGE TO HEART TRANSPLANT: TEN YEARS EXPERIENCE.

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**INTRODUCTION:** The aim of this retrospective analysis of our experience is to identify the best "timing" for left ventricular assist device support.

**METHODS:** Between January 1988 and September 1998, at the "A. De Gasperis" Cardiac Surgery Division - Niguarda Ca' Granda Hospital - Milan, Italy, a mechanical assistance device were applied in 48 patients; in 39 patients VAD was applied as bridge to heart transplantation (HTx). Either pneumatic (ABIOMED, THORATEC) or electrically activated (NOVACOR) pulsatile devices were used.

Of the 39 patients with mechanical circulatory support as bridge to heart transplant, 15 required "emergency" VAD: 1 patient because of graft failure, 2 patients for cardiogenic shock after extensive myocardial infarction and 12 patients had irreversible hemodynamic deterioration despite maximum pharmacological treatment, while waiting a suitable donor for heart transplantation.

Isolated left ventricular assist device (LVAD: Thoratec, Medos, Novacor) was applied in 6 cases while a biventricular assist device (BVAD: Abiomed, Thoratec) was applied in 9 cases.

Twenty-four circulatory support systems as bridge to Htx were applied in patients while on list for heart transplantation with "non - emergency" indication: BVAD (Abiomed, Thoratec) in 2 cases and LVAD (Abiomed, Thoratec, Novacor) in 22 patients.

**RESULTS:** In the "emergency" group (15 pts), 5 patients died on VAD, 10 patients underwent heart transplantation and 6 of them are still alive. In the "non - emergency" group (24 pts), 5 patients died on VAD, 17 underwent Htx and 14 of them are still alive.

Two patients are still on VAD.

The overall survival rate of the "emergency" group was 40 % (6/15) versus 56.4% of our whole experience of VAD as bridge to Htx and 66.6 % of "non - emergency" group.

**CONCLUSIONS:** Results are more encouraging with LVAD as bridge to Htx: overall survival rate 60.7% versus 50% of BVAD. Emergency VAD as a life-saving measure has poor results. Preoperative organ failure is a major challenge. Early VAD indication allow to prevent emergency implantation and further improve results.

### ROLE OF EMERGENCY REVASCULARIZATION FOR ACUTE MYOCARDIAL INFARCTION

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**BACKGROUND:** Surgical emergency revascularization for acute myocardial infarction (AMI) is infrequently used in spite of satisfactory results in term of both survival and preservation of pump function.

**METHODS:** Acute and long term results of a retrospective study are presented.

**RESULTS:** Between January '86 and December '97 we performed surgical revascularization in 142 patients (pts) with large anterior AMI with or without cardiogenic shock. Acute overall mortality was 17.6%; in pts with major clinical/hemodynamic complications mortality was 29.0% versus 6.8% in pts in stable conditions. Survival rate was 97.9% and 80.7% respectively at 1 and 5 years. Two pts required heart transplant. Left ventricle ejection fraction (EF) and left ventricle end diastolic volume (EDV) were evaluated by Echo. EF in the overall population improved from  $37.5 \pm 8.8\%$  preoperatively to

$43.8 \pm 10.1\%$  pre-discharge ( $p=0.0001$ ) and to  $46.4 \pm 12.1\%$  at follow-up (F.U.). In pts operated on within 6 hours from AMI the EF changed from  $35.6 \pm 10.3\%$  preoperatively to  $44.3 \pm 10.1\%$  pre-discharge ( $p=0.002$ ) and to  $50.7 \pm 12.3\%$  at F.U., significantly enhanced respect to pre-discharge control ( $p=0.05$ ). In pts operated on after 12 hours EF changed from  $35.4 \pm 7.7$  to  $42.2 \pm 11.1$  at pre-discharge control ( $p=0.07$ ) and to  $44.8 \pm 12\%$  at F.U. EDV did not changed from preoperative to postoperative evaluation.

**CONCLUSIONS:** Surgical therapy demonstrated to be a life saving procedure and to be effective in preserving left ventricular function. Better results are obtained when surgery is promptly accomplished. As a consequence emergency CABG should not be performed as a "last chance" therapy when the clinical and hemodynamic status are deteriorated.

### USE OF EPIDURAL COOLING FOR PREVENTING SPINAL CORD ISCHEMIC INJURY.

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**INTRODUCTIONS:** SPINAL CORD ISCHEMIC INJURY DURING THORACIC (TA) AND THORACOABDOMINAL (TAA) ANEURYSMS REPAIR REMAINS AN UNSOLVED PROBLEM. THE OVERALL INCIDENCE OF THIS DEVASTATING COMPLICATION HAS BEEN FROM 5% TO 30% CONSIDERING DIFFERENT EXPERIENCES ON THORACIC AND THORACOABDOMINAL AORTIC SURGERY. NONE OF THE SURGICAL ADJUNCTS (SHUNTS, BYPASSES, INTERCOSTAL REIMPLANTATION), CEREBROSPINAL FLUID DRAINAGE ALONE, SEEP, SMEP, NOR PLETHORA OF FARMACOLOGIC MANIPULATION (NALOXONE, STEROIDS, BARBITURES, PAPAVERINE) HAS PROVEN EFFECTIVE IN ELIMINATING THIS COMPLICATION. EPIDURAL COOLING HAS BEEN DESCRIBED AS A QUITE SAFE TECHNIQUE TO INCREASE THE ISCHEMIC TOLLERANCE OF THE SPINAL CORD. **METHODS AND RESULTS:** WE INVESTIGATED THE FEASIBILITY OF ACHIVING REGIONAL HYPOTHERMIA OF THE SPINAL CORD WITH INFUSION OF COLD ( $5^{\circ}\text{C}$ ) RINGER SOLUTION ADMINISTERED INTO A T11-T12 EPIDURAL CATHETER WHILE PERFORMING CEREBROSPINAL FLUID DRAINAGE AND MONITORING CEREBROSPINAL FLUID TEMPERATURE WITH A INTRATHECAL CATHETER PLACED AT L3-L4 LEVEL CONNECTED TO THE EXTRACORPOREAL CIRCULATION PUMP. THIS METHOD HAS BEEN USED IN FIVE PATIENTS SUBMITTED ON TA AND TAA AORTIC REPAIR TREATED WITH SIMPLE AORTIC CROSS-CLAMPING. TWO PATIENTS PRESENTED TYPE II TAA, ONE TA, ONE RUPTURED TA AND ONE TYPE IV TAA. PARAPLEGIA HAS BEEN OBSERVED IN ONE CASE TREATED FOR TYPE II TAA. **CONCLUSIONS:** NO COMPLICATION DUE TO THE EPIDURAL COOLING PROCEDURE WAS OBSERVED. THE DIFFICULTY IN ELIMINATE TEMPERATURE GRADIENT IN THE L3-L4 INTRATHECAL AND OBTAINING A CORRECT TEMPERATURE OF COOLED CEREBROSPINAL FLUID REMAINS THE MOST IMPORTANT TECHNICAL PROBLEM THAT INVALIDATE THE EFFECTIVENESS OF PROCEDURE. NEVERTHELESS, IN OLD MEN' S EPIDURAL SPACE THERE COULD BE THE PRESENCE OF SYNECHIAS THAT DON' T ALLOW TO BE CERTAIN OF COOLING ALL THE SPINAL CORD MORE AT RISK DURING THORACIC AORTIC CROSS-CLAMPING.



## MITRAL VALVE REPLACEMENT IN THE FIRST YEAR OF AGE

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**Introduction:** A small percentage of patients with mitral valve anomaly require surgical treatment in the first year of age. Reconstructive procedure is the procedure of choice, however due to the complex pathology of the mitral apparatus in this age group the valve replacement is sometime required.

**Methods:** Between 1983 and December 1998, 11 infants underwent mitral valve replacement with mechanical prosthesis. Age of the patients ranged from 4 to 12 months (mean 7.3) and the body weight ranged from 3.4 to 8 Kg (mean 5.1). Diagnoses included isolated mitral valve anomaly in 4 patients (36.3%) and mitral valve anomaly associated with complex cardiac anomalies in 7 (63.3%). Six patients underwent one or more previous procedures and one underwent additional procedure.

**Results:** There were 6 hospital death (54%) due to severe low cardiac output. All deaths occurred in the group of patients with complex cardiac anomalies. In a mean follow up of 95 months the survivors remained in good clinical conditions and free from thromboembolic events.

**Discussion & Conclusion:** Mitral valve replacement in the first year of age is a safe and effective long term palliation in patients with isolated mitral valve anomaly. The association with complex cardiac anomalies lead the mitral replacement to an high operative mortality probably due to poor preoperative conditions in this specific group of patients.

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## TRANSAORTIC BRAIN PERFUSION FOR CEREBRAL PROTECTION DURING SURGERY FOR AORTIC DISSECTION.

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**OBJECTIVE :** Selective antegrade perfusion of cerebral vessels appears as a logical means of ensuring brain protection during circulatory arrest, but its use is fraught with the requirement for transfixing cannulation of possibly diseased arteries, the use of a separate heat exchanger and the reliance on weight adjusted flows without accurate control of perfusion pressures. We discuss herein a technique designed for addressing these three issues.

**METHODS :** Between February 97 and December 98 eight patients underwent surgical treatment for acute or chronic type A aortic dissection. All patients were operated on with moderate hypothermia (25°C). After circulatory arrest the aorta was opened and the innominate and left carotid arteries were cannulated through the opened aorta by a triple lumen retrograde cardioplegia catheter. The cerebral flow was adjusted so as to maintain perfusion pressure between 40 and 50 mmHg. Intimal tear was present in the ascending aorta alone in 6 patients and in the aortic arch in 2 patients.

**RESULTS :** The circulatory arrest time was 22.16 min and 56 min for hemiarch + ascending aorta and arch + ascending aorta replacement respectively. The mean cerebral flow was 475 ml/min ranging from 360 to 700 ml/min. There were no death in this series. Seven patients were fully

awake quickly after their return to the ICU (mean ventilation time 7h 40min) one patient was extubated at the 72<sup>nd</sup> hour.

**CONCLUSIONS :** These preliminary results are encouraging and suggest that transaortic pressure controlled brain perfusion is a simple and effective technique for ensuring cerebral protection during operations for type A aortic dissection.

## LEFT SUBCLAVIAN ARTERY-THORACIC DESCENDING AORTA BY-PASS FOR COARCTATION IN ADULTS

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**INTRODUCTIONS:** COARCTATION OF THE AORTA IS CHARACTERIZED BY CONGENITAL STENOSIS OF A SITE IN THE DESCENDING THORACIC, DISTAL AORTIC ARCH OR ABDOMINAL AORTA ASSOCIATED WITH A PRESSURE GRADIENT ACROSS STENOSIS. THREE FORM OF COARCTATION ARE RECOGNIZED: PREDUCTAL, JUXTADUCTAL AND POSTDUCTAL. DETECTION OF UNTREATED COARCTATION OF THE AORTA IN ADULTS IS NOW UNCOMMON. IN MOST PATIENTS PRESENCE OF COARCTATION IS DETECTED DURING ROUTINE PHYSICAL AND INSTRUMENTAL EXAMINATIONS. HYPERTENSION IS THE MOST COMMON SIGN, AND DIAGNOSIS COMES OUT DURING EVALUATIONS OF THE HYPERTENSIVE STATE. 80% OF ADULT PATIENTS WITH UNTREATED COARCTATION DIE OF COMPLICATIONS ASSOCIATED WITH HYPERTENSION. FOR ADULT, SURGICAL MANAGEMENT OF COARCTATION IS MORE COMPLICATED RESPECT CHILDREN, PARTICULARLY SINCE THERE IS OFTEN DILATION OF THE AORTA, AND HISTOLOGICAL SIGNS OF EXTENSIVE MEDIAL DEGENERATION OF THE VESSEL WITH LOSS OF ELASTIC TISSUE IN THE VICINITY OF THE COARCTATION. THUS, FOR ADULTS, AORTIC REPAIR WITH AN INTERPOSITION OF GRAFT IS THE PREFERRED METHOD. METHODS AND RESULTS: IN OUR EXPERIENCE WE PERFORMED 12 LEFT SUBCLAVIAN ARTERY-DESCENDING THORACIC AORTA BYPASS IN ADULT PATIENTS (RANGE 18-44 YEARS) AND 1 ASCENDING-ABDOMINAL AORTIC BYPASS FOR RECOARCTATION IN A 42 YEARS OLD. IN 12 CASES LEFT THORACOTOMY IN IV INTERCOSTAL SPACE HAS BEEN DONE. HYPERTENSION WAS PRESENT IN ALL CASES. PRE-POST STENOSIS BLOOD PRESSURE GRADIENT WAS 40 UP TO 60 mmHg. ANGIOGRAPHY HAS BEEN THE GOLD-STANDARD EXAMINATION IN 100%. PROXIMAL AND DISTAL SIDE-BITING CLAMPING WAS PERFORMED IN ALL CASES USING SATINSKY DEVICE. WE USED 14 TO 16 MM DIAMETER GRAFTS. NO EXTRACORPOREAL CIRCULATION WAS NEEDED. MORTALITY AND MORBIDITY RATE HAS BEEN 0%. NO PARAPLEGIA OR PARAPARESIS HAS BEEN REPORTED. MID-TERM FOLLOW UP DEMONSTRATED NO DIFFERENCES BETWEEN RADIAL AND FEMORAL ARTERY PRESSURE, GOOD CONTROL OF HYPERTENSION IN 100% WITH TOTAL SUSPENSION OF HYPOTENSIVE DRUGS INTAKE IN 41%. WE ALSO OBSERVED MILD DILATATION OF DESCENDING THORACIC AORTA AT LEVEL OF DISTAL GRAFT ANASTOMOSIS IN 1 PTS WITH MEGA-AORTA SYNDROME. **CONCLUSIONS:** WE CONSIDER THIS TECHNIQUE HAS A GOOD METHOD FOR PREVENTING INTRAOPERATORY BLEEDING AND ISCHEMIC SPINAL CORD INJURY REPRESENTED IN LITERATURE IN 2% OF CASES.

**Cavoatrial tumor thrombectomy using cardiopulmonary bypass with circulatory arrest.**

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**Introduction:** the incidence of renal cell carcinoma with vena caval tumor thrombus has been reported in the literature from 4% to 19%, the extension to the level of the right atrium occurs in about 1% of all cases. Thank to the considerable progress made by instrumental total body diagnostics (Echo, Cat., MRI, Angiography, etc.) we are able to establish the real presence, extension and dimension of tumor thrombus.

**Material and methods:** from April 1987 to September 1998, 10 patients, 5 male and 5 female (age, 10 to 68 years, mean age 43.8), underwent surgical treatment for renal or adrenal malignant tumors and an inferior vena caval thrombus extending into the right atrium. All patients underwent complete tumor excision and inferior vena caval thrombectomy using adjunctive cardiopulmonary bypass and deep hypothermic circulatory arrest.

**Results:** in the operative and postoperative period there was none death and none major complication. At January 1999, 5 patient (50%) are alive with mean survival of 4,52 years (min 0,30, max 7,55); 3 of these patients (60%) are free of malignancy at a mean of 3,9 years; one patient is alive with metastatic disease about 12 months postoperatively; one patient is alive with relapse in situ of the tumour about 24 months postoperatively.

**Conclusions:** our results suggest that the surgical treatment in these patients is the elective therapeutic strategy if the tumor invasion doesn't involve the perinephric fat, lymphonodes and distant metastases. The cephalad extent of the inferior vena cava tumor thrombus doesn't appear to be prognostically important. Some authors have advocated only cardiopulmonary bypass without circulatory arrest in these patients. We find that the perfect visualisation and safe excision can be performed only with cardiopulmonary bypass and profound hypothermia and circulatory arrest.

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**KAZUI'S TECHNIQUE AS METHOD OF CEREBRAL PROTECTION DURING SURGERY OF THE THORACIC AORTA: OUR EXPERIENCE.**

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**BACKGROUND.** The most common technique of cerebral protection during operations involving thoracic aorta is the hypothermic circulatory arrest. Its principle drawbacks consist in the limited safe ischemia period and pulmonary, renal and coagulative complications due to low body temperature and prolonged CPB. In an effort to obviate to these problems, two years ago we started to perform Kazui's antegrade cerebral perfusion technique with moderate hypothermia as method of cerebral protection.

**METHODS.** Since November 1996 to December 1998, 57 consecutive patients (mean age 63 years) were operated on with Kazui's technique. Thirty-six subjects had aneurysm, 20 had acute dissection and 1 had chronic dissection involving the ascending aorta. Of these, 18 patients underwent

operation on ascending aorta, 21 on ascending aorta and arch, 3 on the entire thoracic aorta, 3 on arch and descending aorta, 12 on the aortic arch. 21 patients underwent emergency operation. The associated procedures were aortic valve replacement in 15 patients, CABG in 5, Bentall procedure in 12. The main cerebral perfusion time was 51 minutes. **RESULTS.** There were 6 in-hospital deaths caused by bleeding in 3 cases, MOF in 1 and cardiac complications in 2. We did not observe any major neurologic complications. **CONCLUSIONS.** In our experience the technique of moderately hypothermic cardiopulmonary by-pass and selective cerebral perfusion during surgery of thoracic aorta has provided good results with regard to cerebral and organ function preservation. Therefore it may be considered as a "safe" alternative to profound hypothermia associated with cardiocirculatory arrest during thoracic aorta operations.

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**Right ventricular outflow tract reconstruction: alternative procedures**

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**Introduction:** Increased evidence of late RV failure after reconstruction of the RVOT resulting in pulmonary valve regurgitation (PVR) emphasizes the need for a competent and lasting valvar device in such cases.

**Methods:** Since March 1996 54 patients received RVOT reconstruction for TOF (34), PA+VSD (9), TGA+VSD+PS (4), ccTGA+VSD+PS (2), VSD+PS (2), Complete AV Canal+TOF (2), DORV (1). Transannular/infundibular patches, homografts and valved conduits were used in 37 patients. Alternative valvar substitutes were used in 17 pts: PTFE monocusps were used in 9 pts primarily and in 4 pts late after transannular patch repair. Median age at operation was 6 years. Bileaflet St. Jude valves were used in 4 male pts at the third or fourth operation. Mean age at operation was 17 years.

**Results:** One early death for acute right ventricular failure occurred among pts who received the monocusp valve. All the other patients had an uneventful postoperative recovery. The mean follow-up was 17 months. On the echocardiogram PVR was considered moderate in 3 pts, mild in 5 and trivial in 4. No residual gradients were observed except in 1 pt who had multilevel obstructions. Mortality and morbidity were absent in all pts who received the mechanical valve. INR was kept between 3 and 3.5 with Coumadin. After a mean follow-up of 10 months the echocardiogram showed good function of the valve and trivial transvalvar gradients.

**Discussion:** The diastolic flow detected at the monocusp level on the echocardiogram is not the PVR but the amount of blood which fills the cusp during diastole, since it has the same length of the transannular patch.

**Conclusions:** At the moment an ideal valvar substitute does not exist. In selected cases alternative procedures should be advocated. Mechanical valves are indicated in adults who had several previous operations. At the primary repair the PTFE monocusp may be a good valvar substitute but a longer follow-up is needed.

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